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(71) Applicant

Silvani Antincendi SpA,

(Italy),

Viale De Gasperi,

40 San Martino DI

Bareggio,

Milan,

Italy.

(72) Inventor

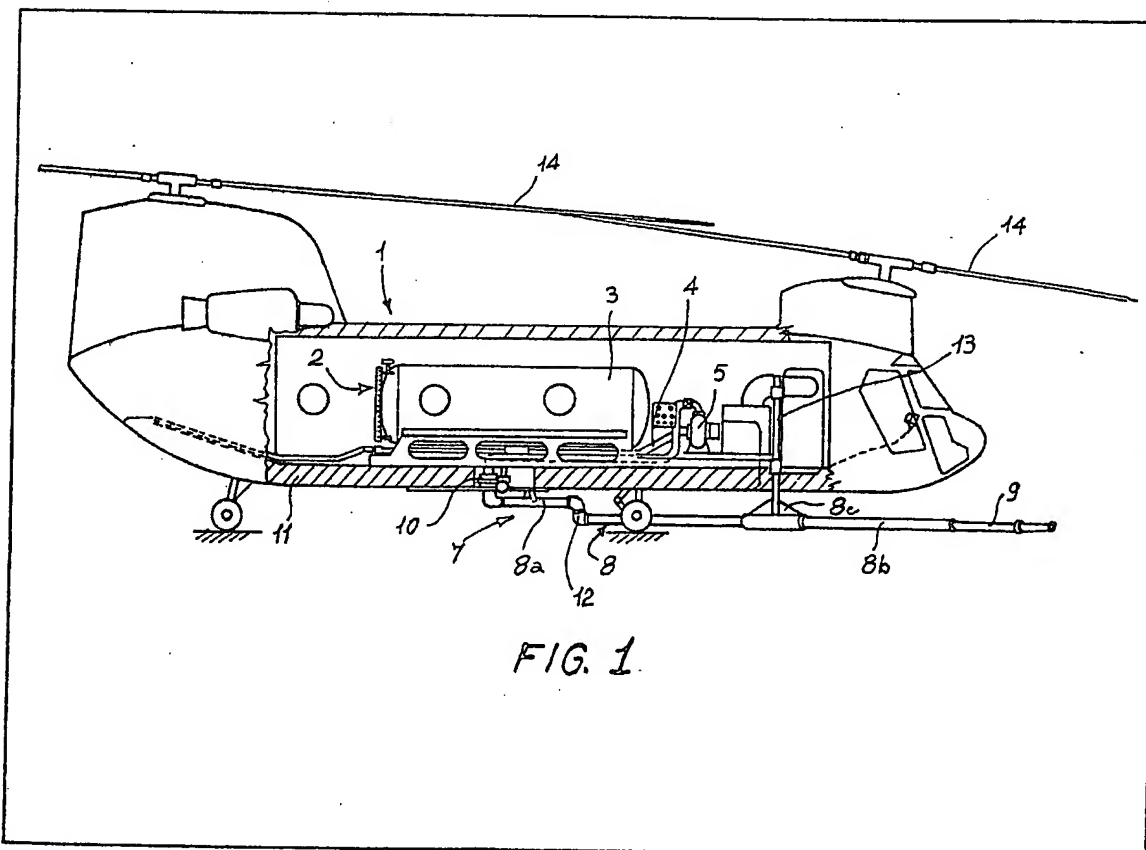
Cesare Khouzam

(74) Agent and/or Address for Service

Marks & Clerk,  
Scottish Life House,  
Bridge Street,  
Manchester M3 3DP.

(54) Apparatus for discharging fire-extinguishing liquids particularly for fire-units transported by a helicopter

(57) An apparatus for discharging fire-extinguishing liquids, particularly for fire-units transported by a helicopter, comprising a rotary nozzle consisting of a first nozzle arm connected, at one end thereof, to a drivingly swinging joint, secured to the base of the bearing structure of the helicopter and joined, in turn, to the fire-extinguishing liquid feed tank and, at the other end thereof, after interposing an articulated joint, to a second nozzle arm connected at its end to a spout and pivoted, at its intermediate portion, on the base of a supporting rod vertically secured to the bearing structure of the helicopter.



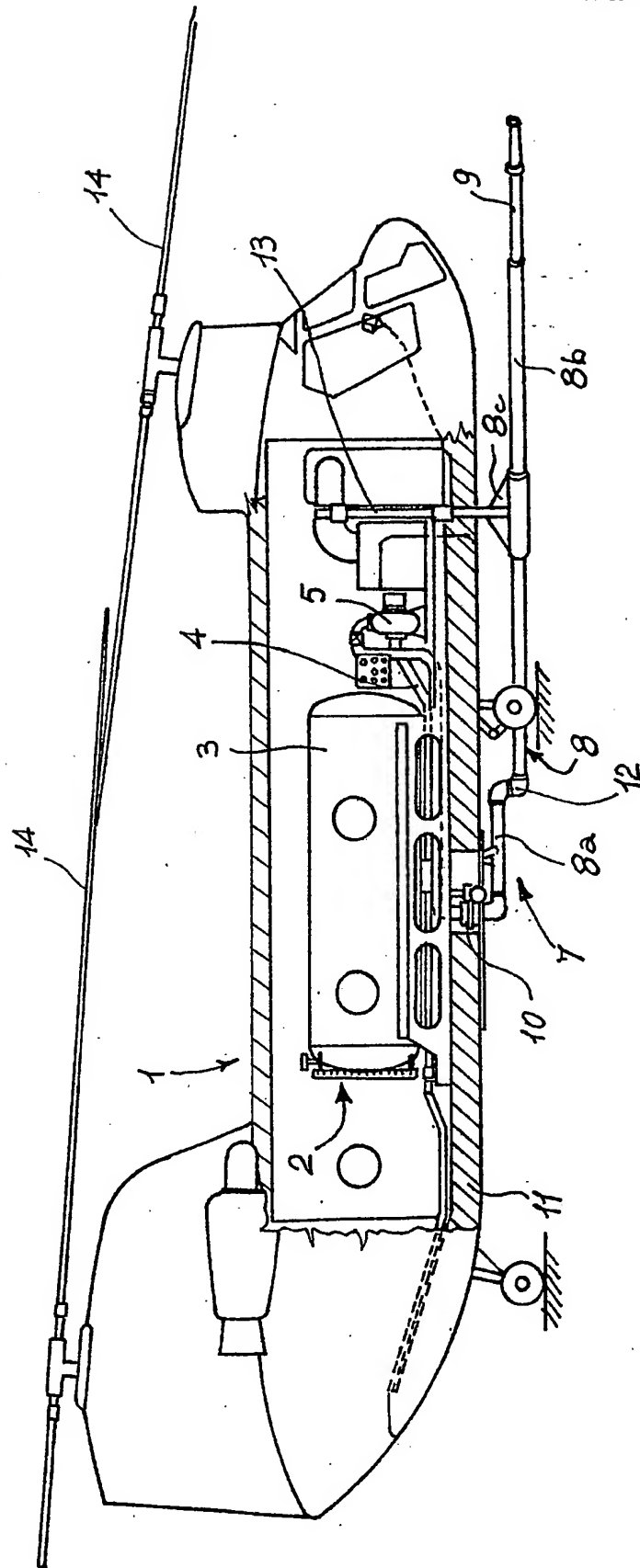
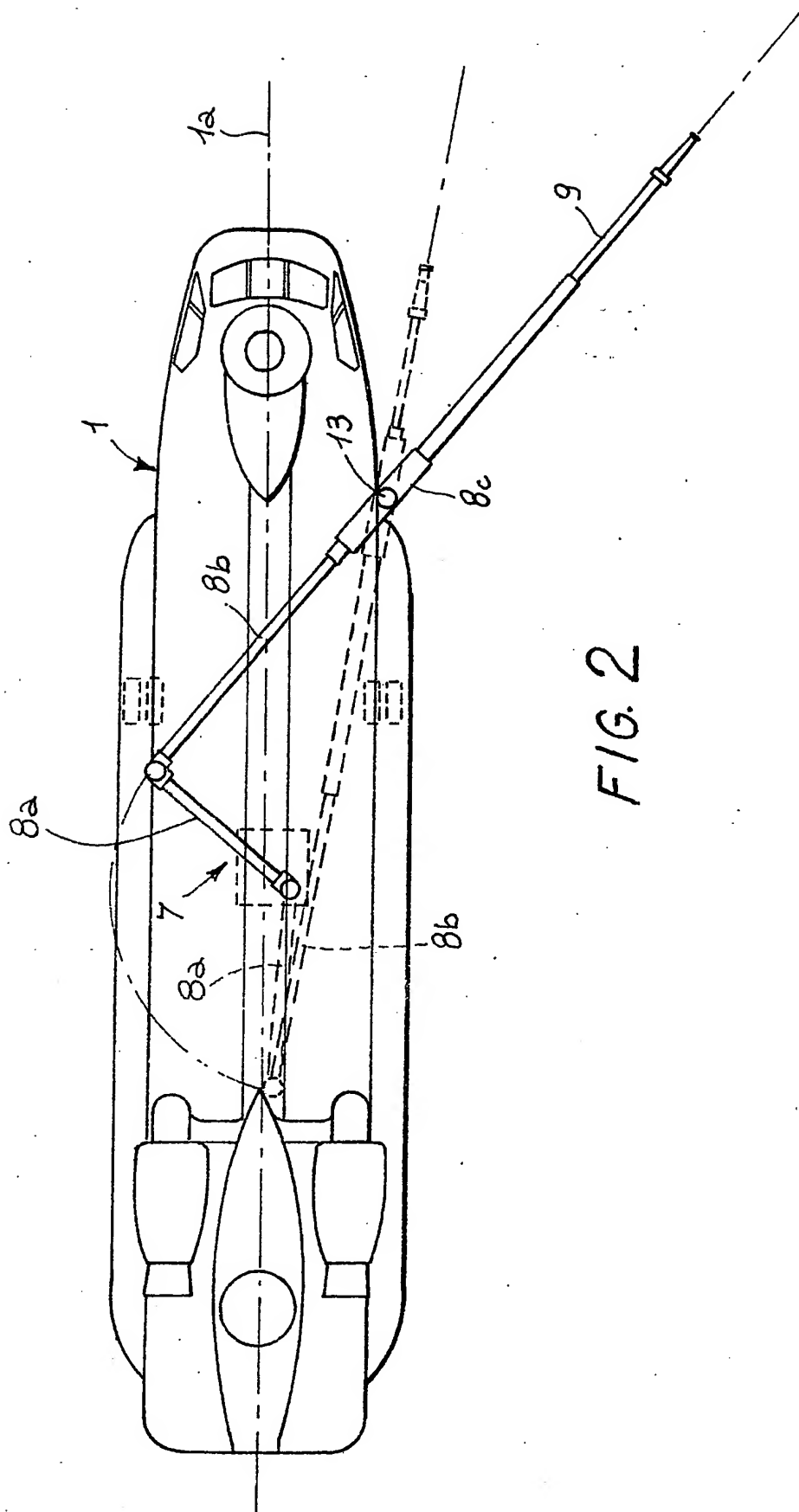


FIG. 1



## SPECIFICATION

## Improvements in or relating to fire extinguishers

5 The present invention relates to an apparatus for discharging fire-extinguishing liquids, particularly for fire-units transported by a helicopter.

It is known that the continual research for means and materials suitable to extinguish any type of fire in the most opportune and efficient manner, above all fires which develop in inaccessible localities far away from build-up areas provided with a fire service, has brought to the study, development and accomplishment of helitransported (that is trans-

15 ported by a helicopter) fire-units.

The fire units of the above specified type essentially consist of a foaming mixture tank from which the fire-extinguishing liquid is sent, through a pump actuated by a turbine, to a discharging device which includes an essentially tubular body of nozzle provided at its end with a spout. This nozzle is at present mounted under the helicopter by means of an articulated connection disposed at the opposite end thereof with respect to the spout in order to allow the widest direction control of the jet. More particularly, according to the known art, the nozzle can be directed from a first non-operative position in which it is substantially parallel to the running axis of the helicopter, to a second operative position in which it is disposed according to a predetermined angle with respect to said axis.

Furthermore, it should be observed that nozzles hitherto used on helicopters are provided with a rigid and horizontally swingable framework having a particularly bulky length, owing to the fact that, under operative conditions, the spout put at the end of the nozzle must be beyond the reach of the helicopter blades, in order to avoid the airflow generated by the latter to interfere with the jet of fire-extinguishing liquid discharged so that said jet is not prevented from turning correctly towards the objective.

These liquid-discharging devices of the known type have proved to be rather weak and bulky from a structural point of view and therefore unsuitable to discharge important amounts of foaming mixture in a unit time. Practically the maximal available deliveries with the liquid-discharging devices of the known art do not exceed 400 litres per minute, which obviously involves a rather long intervention time before attaining the extinction of a fire with specific deliveries (that is per unit of fired surface), sometimes insufficient for quenching the fire.

It is therefore an object of the present invention to remarkably increase the deliveries of the liquid-discharging apparatuses set up on helitransported fire-units so that quicker and more efficient operative interventions are involved.

A further important object of the present invention is to provide an apparatus for discharging fire-extinguishing liquids in which the delivery increase does not impair the normal stability conditions of the helicopter.

According to the present invention there is provided an apparatus for discharging fire-

extinguishing liquids, particularly for fire-units transported by a helicopter of the kind including a substantially tubular body or nozzle provided at its end with a spout and suitable to be directed from a first non-operative position, parallel to the running axis of the helicopter to a second operative position disposed according to a predetermined angle with respect to the said first position, characterised in that it comprises a first nozzle arm connected, at one end thereof, to a drivingly swinging joint, secured to the base of the bearing structure of the helicopter and joined, in turn, to the fire-extinguishing liquid feed tank, and at the other end thereof, after interposing an articulated joint, to a second nozzle arm connected at its end to said spout and pivoted, in an intermediate position, on the end portion of a supporting rod vertically secured to the bearing structure of the helicopter.

Advantageously, the said arm can be displaced as far as the spout is brought out of the airflow generated by the helicopter blades.

Further features and advantages of the invention will become more apparent from the detailed description of a preferred embodiment of an apparatus for discharging fire-extinguishing liquids, particularly for helitransported fire-units, given hereinafter by way of example only, with reference to the accompanying drawings in which:-

*Figure 1* is a partially cross-sectioned view of a helitransported fire-unit embodying the liquid-discharging apparatus according to the present invention;

*Figure 2* is a plan view of the helicopter in which the liquid-discharging apparatus is shown in an operative position and in a rest position.

Referring to the drawings, and to the first figure in particular, it has been generally indicated at 1 a helicopter at the inside of which is disposed fire-unit globally indicated at 2. Fire-unit 2 consists, in a conventional manner, of a tank 3, suitable to contain a fire-extinguishing liquid generally composed of a water and foam mixture, which is connected, through a pipe 4, to a pump 5 actuated by a turbine. Pump 5 is connected, in turn, through a flow piping 6, to a liquid-discharging apparatus globally indicated at 7 in the figures.

Said liquid-discharging apparatus 7 is disposed under the helicopter and it substantially consists of a tubular body or nozzle 8 terminating in a spout 9. The nozzle 8 is suitable to be directed from a non-operative position to an operative position, according to procedures to be described later in more detail.

According to the present invention, nozzle 8 consists of a first arm 8a connected at one end thereof to a swinging joint (10) secured to the base of the bearing structure 11 of the helicopter 1. The other end of arm 8a of nozzle 8 is connected, by means of an articulated joint 12, to one end of a second nozzle arm 8b, the other end of which terminates in the above mentioned spout 9.

It is possible to see, above all in *Figure 1*, that the second arm 8b of nozzle 8 is pivoted, in its intermediate position 8c, on the end portion of a rod 13 vertically secured to the bearing structure 11 of the

helicopter 1.

Advantageously and according to a further feature of the invention, the second arm 8b of nozzle 8 is extensible by drawing. In this way, when the liquid-discharging apparatus 7 is disposed in its operative position, arm 8b will be in such a position that spout 9 will be beyond the airflow generated by the helicopter blades 14, thus avoiding the breaking of jet coming out of spout 9.

- 10 Referring particularly to Figure 2 and as previously said, the liquid-discharging apparatus 7, and particularly said nozzle 8, is suitable to carry out angular displacements from a first non-operative position, in which the axis of nozzle 8 is substantially parallel to the running axis 1a of the helicopter 1, to an operative position disposed transversely to said axis 1a.

More particularly, when it is under non-operative conditions, the liquid-discharging apparatus 7 is disposed as shown in dotted lines in Figure 2 and it forms an angle of about 10° with the running axis 1a of the helicopter 1, while on operative conditions it is disposed as shown in solid lines and forms an angle of about 40° with said axis 1a.

- 25 After what described above from a structural point of view, the operation of the apparatus for discharging fire-extinguishing liquids, according to the invention, appears evident.

The helicopter approach operation to the area in which there is a fire to be quenched occurs when the liquid-discharging apparatus is disposed according to the position shown in dotted lines in Figure 2, that is when nozzle 8 forms an angle of about 10° with the helicopter axis 1a and the arm 8b thereof is back-drawn. Once the zone where there is a fire is reached, the pilot actuates the swinging joint 10 so that nozzle 8 is brought to its operative condition, as shown by solid lines in Figure 2, the arm 8b of said nozzle 8 being completely drawn out so that spout 9 is beyond the airflow generated by the blades 14 of helicopter 1.

With the apparatus for discharging fire-extinguishing liquid described above it is possible to reach deliveries of about 2000 liters per minute, thus considerably increasing the efficiency of the fire-extinguishing operation. The values within which deliveries are maintained does not depend upon particular limits imposed by the liquid-discharging apparatus, but it is a consequence of the loading possibilities of the helicopter.

Furthermore, it should be understood that the strong structure of the apparatus according to the invention together with the suitable arrangement of the different components do not cause lack of balance that cannot be controlled by the pilot, to the helicopter.

On the contrary, the operative position of the spout 9 can be easily seen by the pilot which can therefore easily control the liquid jet and also promptly execute those operations that allow him to leave the zone where the fire took place when emergency conditions occur; this is due to the fact that under operative conditions he is already rotated through about 40° with respect to the fire/helicopter directrix.

Obviously, many modifications and variations can be made to the apparatus for discharging fire-extinguishing liquid according to the present invention, without departing from the spirit and scope of the invention itself.

## CLAIMS

1. An apparatus for discharging fire-extinguishing liquids, particularly for fire-units transported by a helicopter, of the kind including a substantially tubular body of nozzle provided at its end with a spout and suitable to be directed from a first non-operative position, parallel to the running axis of the helicopter, to a second operative position disposed according to a predetermined angle with respect to said first position, characterised in that it comprises a first nozzle arm connected, at one end thereof, to a drivingly swinging joint, secured to the base of the bearing structure of the helicopter and joined in turn, to the fire-extinguishing liquid feed tank, and at the other end thereof, after interposing an articulated joint, to a second nozzle arm connected at its end to said spout and pivoted, in an intermediate position, on the end portion of a supporting rod vertically secured to the bearing structure of the helicopter.
2. An apparatus according to claim 1, characterised in that said second arm can be displaced as far as the spout is brought beyond the airflow generated by the blades of the helicopter.
3. An apparatus according to claim 1, characterised in that the axis of said second arm, when it is in a non-operative position, forms an angle of about 10° with the running axis of the helicopter while, when it is in an operative position, it forms an angle of about 40° with the same axis.
4. Fire extinguishing apparatus, substantially as hereinbefore described with reference to the accompanying drawings.